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INFORMATION SHEET ON DRYING-RATE NOMOGRAPHS
V. ONION SLICES

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A method of estimating drying times from drying-rate nomographs has been published in the form of an information sheet (AIC-31-I), and drying-rate nomographs are available for riced white potatoes (AIC-31-I), blanched sweet corn (AIC-31-II), white potato strips under through-flow conditions (AIC-31-III), and shredded cabbage (AIC-31-IV).

The drying-rate characteristics of 1/8" onion slices are presented nomographically in this information sheet. The onions, Southport White Globe variety, were peeled and trimmed by hand and cut into 1/8" slices in a mechanical vegetable slicer. The onion slices were loaded on the drying trays and dried in the raw state.

The first set of nomographs (Figures 1 to 4) deals with the drying rates of onion slices on metal grid trays, and the second set (Figures 5 to 8) with onion slices on wooden slat trays. Specifically, the following nomographs are included in this information sheet:

Metal Grid Trays	Wooden Slat Trays	Subject
Figure 1	Figure 5	Drying from $T_o = 7.6$ to $T = 0.20$
Figure 2	Figure 6	Effect of L_o and V on Figures 1 and 5
Figure 3	Figure 7	Drying from $T = 0.20$ to T_f
Figure 4	Figure 8	θ corrections for $T_o > 7.6$

The effects of tray loading density and air velocity upon the drying times from $T_o = 7.6$ to $T = 0.20$ are related by the equations:

for metal grid trays, $\theta \text{ (at } L_o, V) = \theta_r \cdot f(L_o) \cdot f(V)$ (1)
for wooden slat trays, $\theta \text{ (at } L_o, V) = \theta_r \cdot f(V, L_o)$ (2)

In these equations, θ_r is the drying time from T_o to T under reference conditions (of $L_o = 1.0$ lb./sq. ft. and V = 780 ft./min.) as obtained from Figure 1 or 5. For equation (1), values of $f(L_o)$ and $f(V)$ are selected from Figure 2, and for equation (2), values of $f(V, L_o)$ are selected from Figure 6. In both equations, these functions must correspond to the values of L_o and V under consideration, and must be selected at the value of T to which θ and θ_r apply. (The nomenclature used is that listed in Information Sheet AIC-31-I.)

Below T = 0.20, drying times are independent of air velocity (from V = 400 to 1200 ft./min.) for both types of tray. The drying times below T = 0.20 are also independent of tray type and loading density (between $L_o = 0.5$ and 2.0 lb./sq. ft.) except for the range of T = 0.07 to T_f on wooden slat trays. In the latter case, the drying time for the interval of T = 0.07 to 0.04 may be 60% greater when $L_o = 1.8$ than when $L_o = 0.5$ or 1.0

General Notes on Onions

During the experimental work, the onions were held in storage at 33° F. for two months. The following analyses, expressed on the wet or "as received" basis, show changes which occurred in the sugar content of the onions:

Material	Water Content	Total Sugar Content	Reducing Sugar Content
As received	88.2%	9.1%	2.6%
After 2 months of storage	87.4%	9.4%	4.5%

In drying Southport White Globe onions from T_0 to $T = 0.04$, 3/16" slices require about 80% more time on metal grid trays, or about 65% more time on wooden slat trays, than is required by 1/8" slices. On this basis, the drying of 3/16" slices in preference to 1/8" slices cannot be recommended because of the lower production rate which would follow directly and because of the extreme susceptibility of onions to time-temperature injury. If 3/16" slices are dried, however, the relative advantage in drying time of metal grid trays over wooden slat trays will be less than in the case of 1/8" slices.

For other values of L_o and V, see Figure 2.

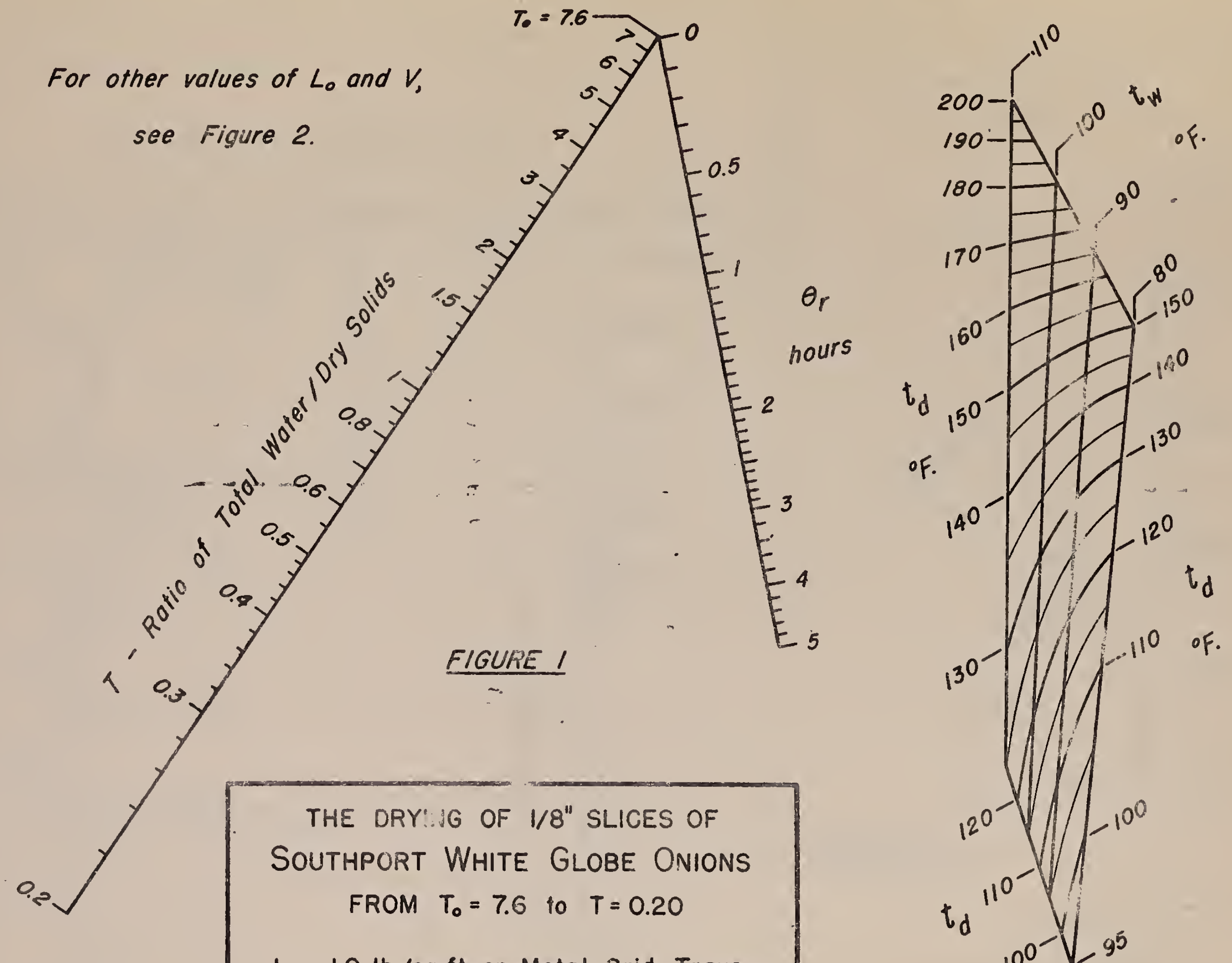


FIGURE I

THE DRYING OF 1/8" SLICES OF
SOUTHPORT WHITE GLOBE ONIONS
FROM T_o = 7.6 to T = 0.20

L_o = 1.0 lb./sq.ft. on Metal Grid Trays
V = 780 ft./min., Cross Air Flow

11-10-43 M.E.L.
2-4-44 A.H.B.

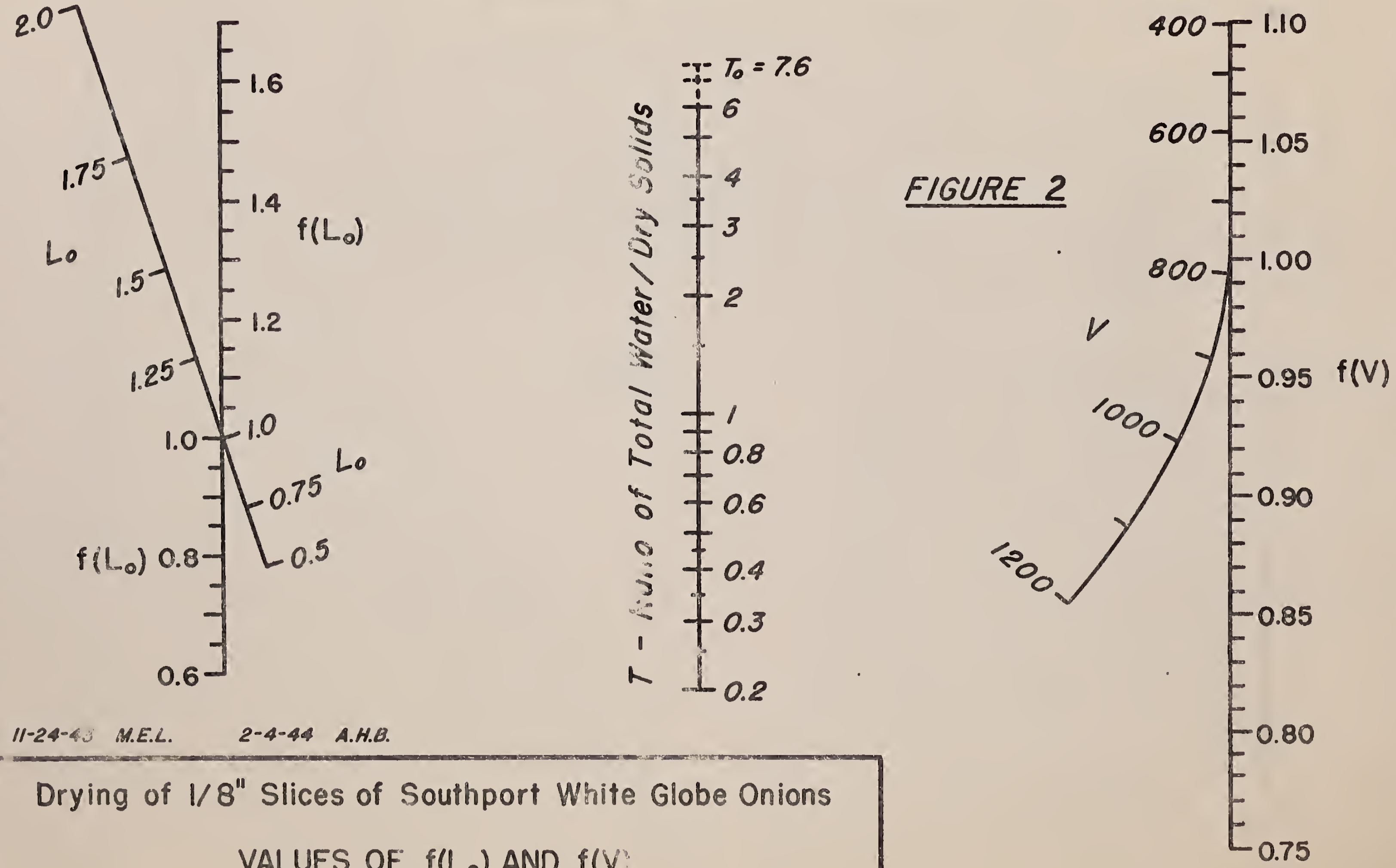


FIGURE 2

11-24-43 M.E.L. 2-4-44 A.H.B.

Drying of 1/8" Slices of Southport White Globe Onions

VALUES OF $f(L_o)$ AND $f(V)$

Metal Grid Trays Cross Air Flow

L_o and V sides of nomograph are independent.

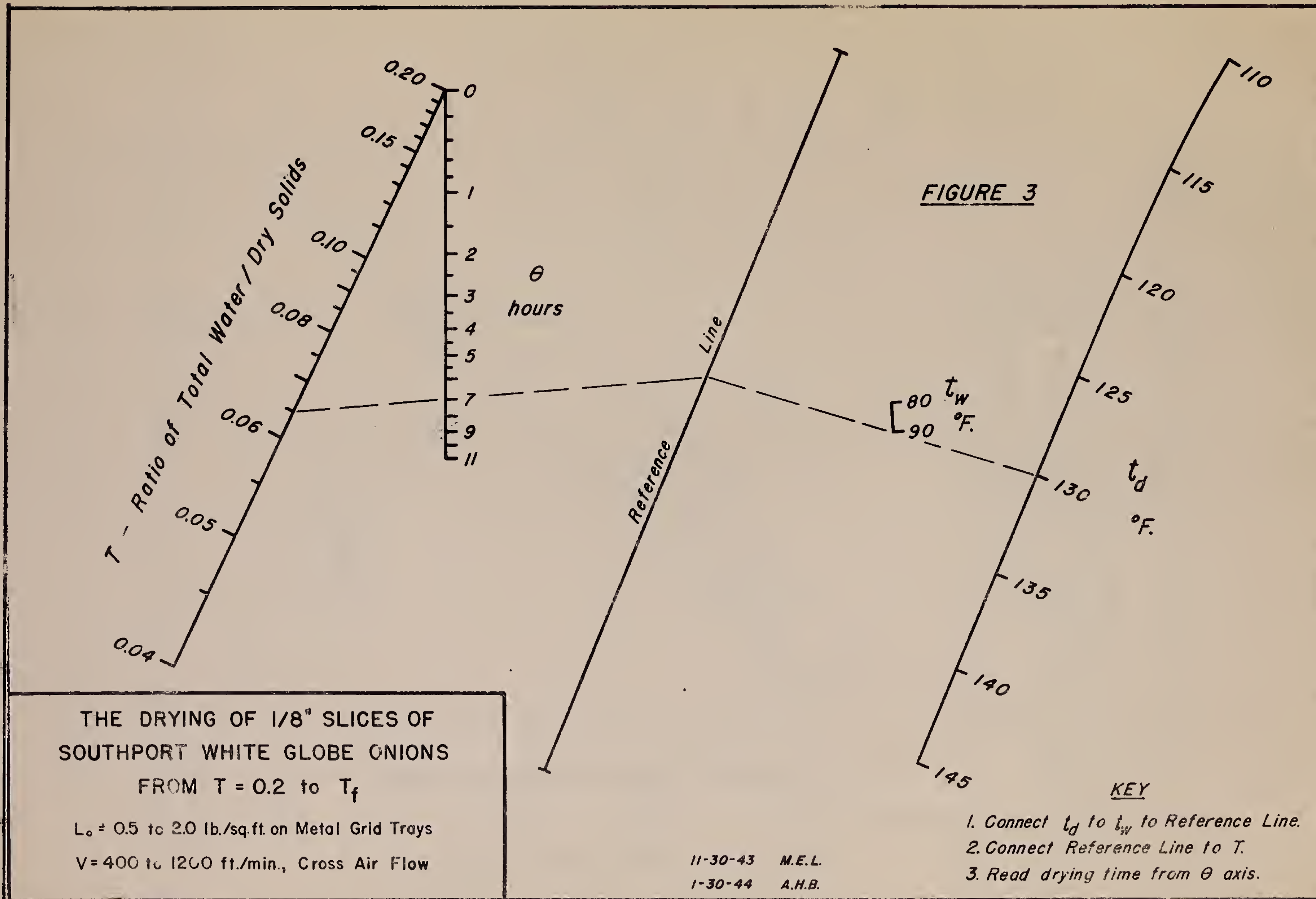


FIGURE 3
T - Ratio of Total Water / Dry Solids
0.20
0.15
0.10
0.08
0.06
0.05
0.04
0
1
2
3
4
5
7
9
11
θ
hours
Reference Line
80
90
t_w
°F.
110
115
120
125
130
135
140
145
t_d
°F.
THE DRYING OF 1/8" SLICES OF
SOUTHPORT WHITE GLOBE ONIONS
FROM T = 0.2 to T_f
L_o = 0.5 to 2.0 lb./sq.ft. on Metal Grid Trays
V = 400 to 1200 ft./min., Cross Air Flow
11-30-43 M.E.L.
1-30-44 A.H.B.
KEY
1. Connect t_d to t_w to Reference Line.
2. Connect Reference Line to T.
3. Read drying time from θ axis.

Drying of 1/8" Slices of Southport White Globe Onions

CORRECTION OF θ_r FOR $T_o > 7.6$

L_o = 1.0 lb./sq.ft. on Metal Grid Trays

V = 780 ft./min., Cross Air Flow

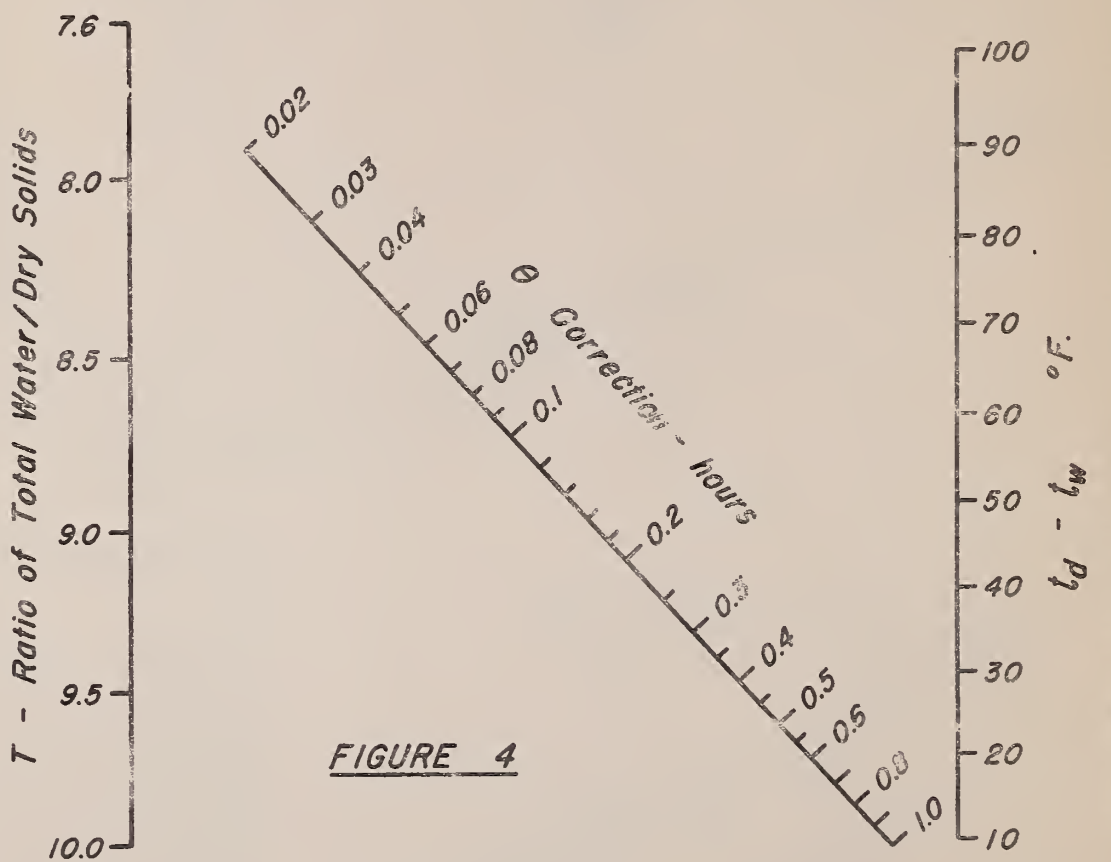


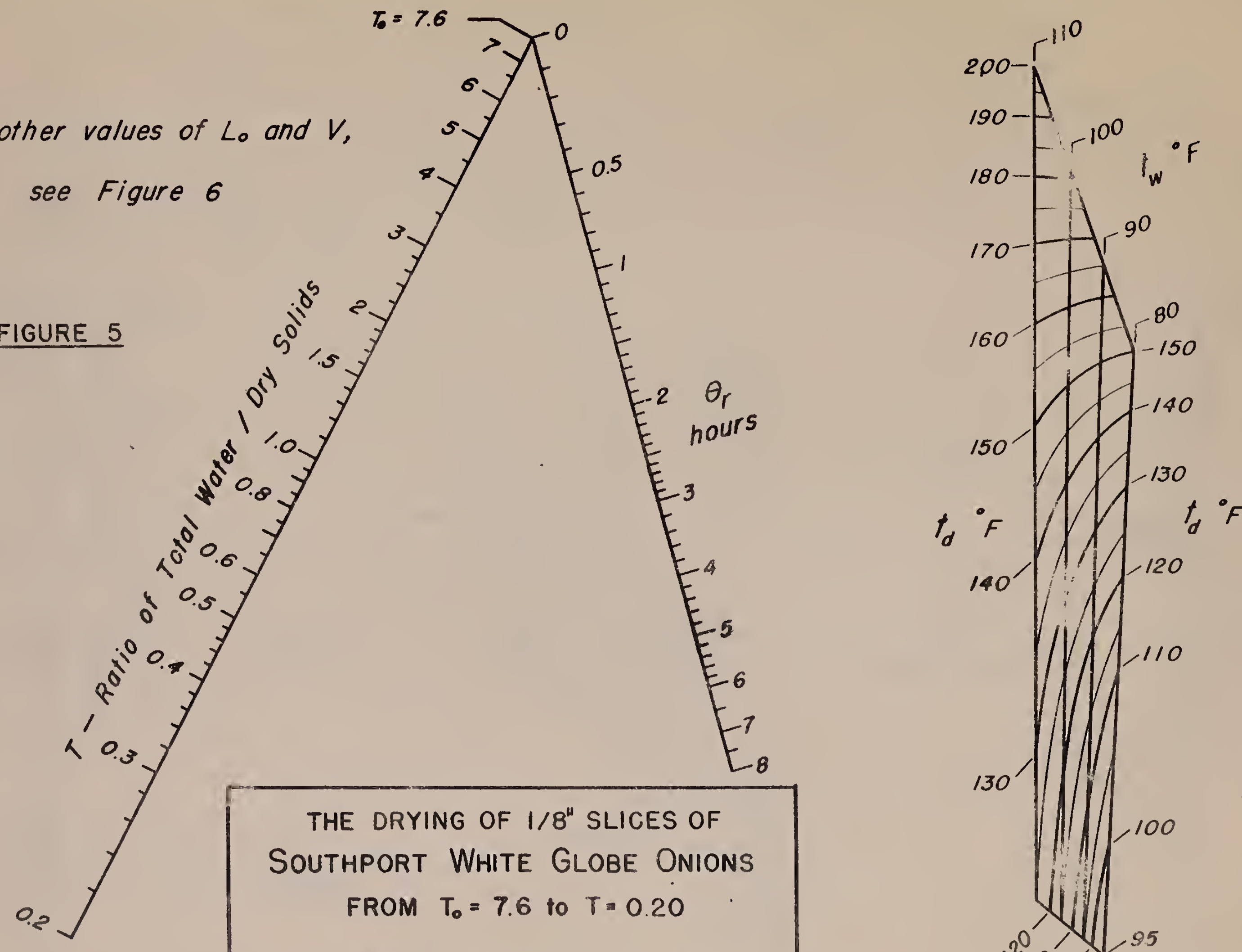
FIGURE 4

11-13-43 M.E.L.

2-4-44 A.H.B.

For other values of L_o and V, see Figure 6

FIGURE 5



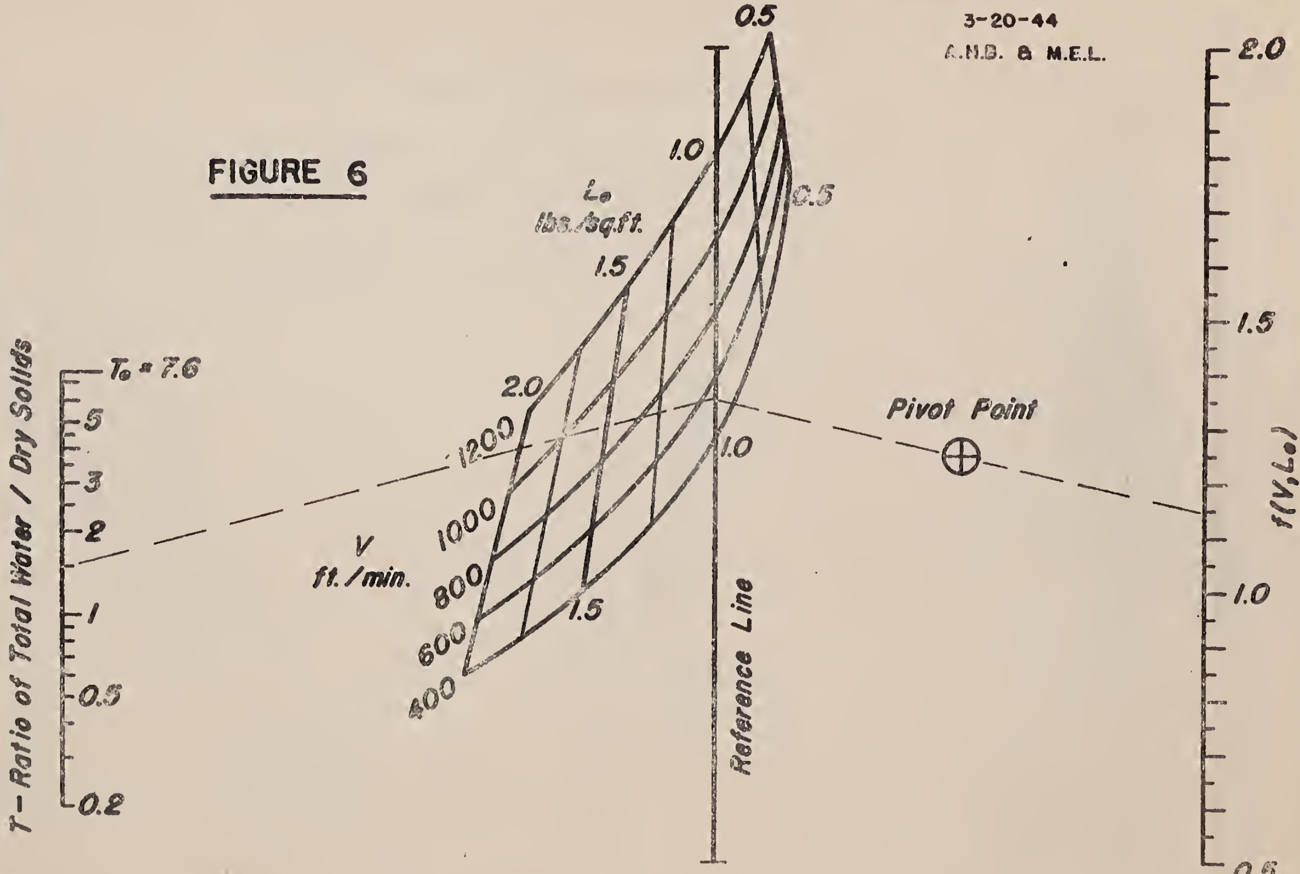
THE DRYING OF 1/8" SLICES OF SOUTHPORT WHITE GLOBE ONIONS FROM T_o = 7.6 to T = 0.20

L_o = 1.0 lb./sq.ft. on Wooden Slat Trays

V = 780 ft./min., Cross Air Flow

2-18-44 M.E.L.

FIGURE 6



THE DRYING OF 1/8" SLICES OF
SOUTHPORT WHITE GLOBE ONIONS
VALUES OF $f(V,L_o)$
Wooden Slat Trays — Cross Air Flow

KEY

1. Connect T to V, L_o to ref. line.
2. Connect ref. line through pivot point to $f(V,L_o)$ scale.
3. Read value of $f(V,L_o)$

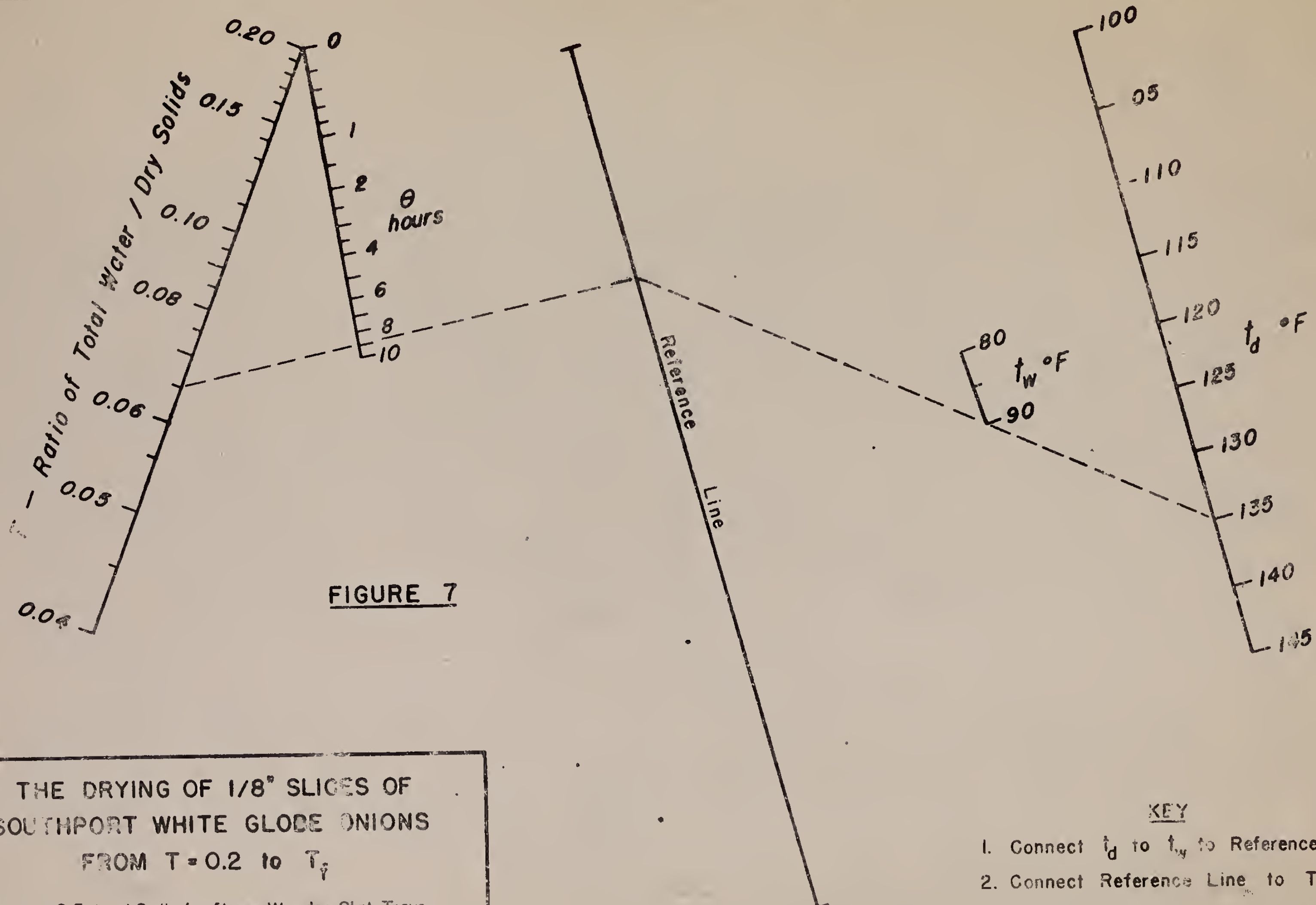


FIGURE 7

THE DRYING OF 1/8" SLICES OF SOUTHPORT WHITE GLOBE ONIONS FROM T = 0.2 to T_f

L_o = 0.5 to 1.2 lb./sq.ft. on Wooden Slat Trays

V = 400 to 1200 ft./min., Cross Air Flow

KEY

1. Connect t_d to t_w to Reference Line.
2. Connect Reference Line to T.
3. Read drying time from θ axis.

2-22-44 A.H.B. & M.E.L.

Drying of 1/8" Slices of Southport White Globe Onions

CORRECTION OF θ_r FOR $T_o > 7.6$

L_o = 1.0 lb./sq.ft. on Wooden Slat Trays

V = 780 ft./min., Cross Air Flow

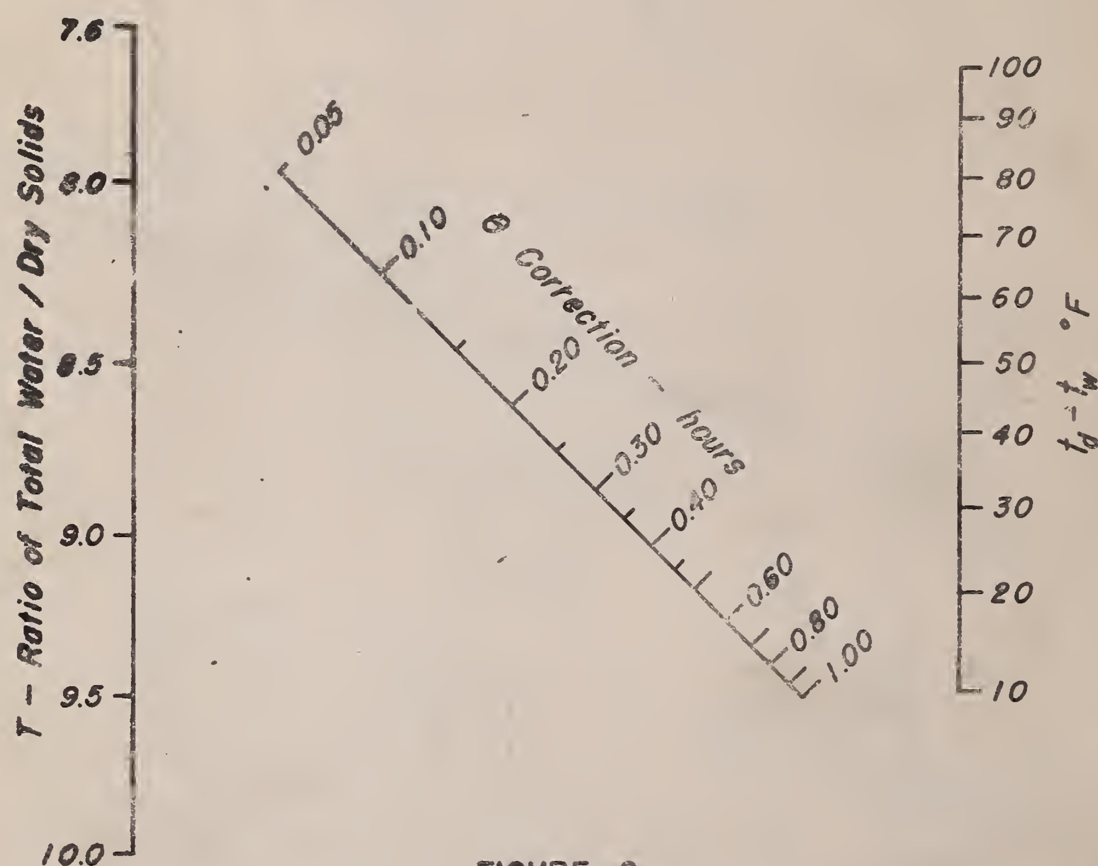


FIGURE 8

2-21-44 M.E.L.